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USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK: D-4 TEST STAND, AIRC--ETC(U)
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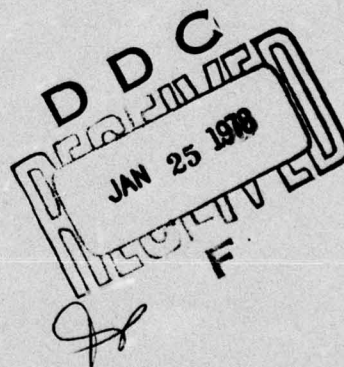


**USAF BIOENVIRONMENTAL NOISE DATA
HANDBOOK**

Volume 115

D-4 Test Stand, Aircraft Hydraulic System

DECEMBER 1976



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AEROSPACE MEDICAL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
AIR FORCE SYSTEMS COMMAND
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→ for total daily exposure of personnel with and without standard Air Force ear protectors. Refer to Volume 1 of this handbook, *USAF Bioenvironmental Noise Data Handbook, Vol. 1: Organization, Content and Application*, AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. ↗

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PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 723104, Measurement and Prediction of Noise Environments of Air Force Operations.

The author acknowledges the efforts of Mr. Robert T. England and Mr. Robert G. Powell who conducted the field measurements, and Mr. John N. Cole who established the data analysis requirements and assisted in the preparation of this report. Mr. Henry Mohlman and Mr. David Eilerman of the University of Dayton assisted in the mechanics of data processing, and Mrs. Norma Peachey typed and prepared the graphics.

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NEAR-FIELD NOISE

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INTRODUCTION

The D-4 Hydraulic Test Stand is an electric motor-driven unit designed to test aircraft hydraulic systems.

This volume provides measured data defining the bioacoustic environments produced by this unit. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with operations of the D-4 test stand.

This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and ground support equipment. The far-field, community-type, noise data in the handbook describe the noise produced during *ground operations* of aircraft, ground support equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Volume 2 provides a method and data for adjusting the handbook's far-field noise data, which are for standard meteorological conditions (15C temperature, 0% rel humidity, 0.760 meters Hg barometric pressure) to derive comparable data for other meteorological conditions. *Refer to Volumes 1 and 2* (references 1 and 2) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., inflight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published. This index is periodically updated as individual volumes are published, and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of the updated index as it is generated.

Direct any questions concerning the technical data in this report and other handbook volumes to: AMRL/BBE, Wright-Patterson AFB, OH 45433; Autovon 78-53675 or 78-53664; Commercial (513) 555-3675 or (513) 255-3664.

. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 1: Organization, Content and Application*, AMRL-TR-75-50 (1), Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, 1975.

. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 2: Procedure to Evaluate Effects of Non-standard Meteorological Conditions on Far-Field Noise*, AMRL-TR-75-50 (2), AMRL, VPAFB, OH, 1975.

NEAR-FIELD NOISE

MEASUREMENTS

A standard D-4 Test Stand was operated inside, and approximately in the center of a large aircraft hanger (167.6 m long \times 36.6 m wide \times 18.3 m high) on a concrete floor at a normal rated/loaded condition. The hanger walls and ceiling were not acoustically treated. No aircraft were in the vicinity of the unit while being measured. No far-field acoustic data were acquired because of the relatively close proximity of the hanger walls.

Figure 1 identifies 36 noise measurement locations at a height of 1.5 meters above the concrete apron (nominal ear level of ground crew). The 0 degree reference direction passes through the tow bar. These locations are in the acoustic near-field of the source where the sound wave fronts generally do not spherically diverge and the source appears to be spatially distributed (i.e., not a point source). Consequently, these near-field data cannot be extrapolated to longer distances but do properly define the levels at locations close to the unit.

Near-field measurements were also made at ear level at the operator control panel. Table 1 lists the numeric/alphabetic designators used on the data pages in this report to identify the operator measurement location and test conditions. The designator 1/A means operator location 1 and test condition A. Such a descriptor is essential in many handbook volumes that involve multiple combinations of locations/conditions. It is used in this report to maintain format consistency.

RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced by the D-4 unit at the 37 specified, near-field locations. This table includes the overall, 1/3 octave band, and octave band levels. From these data one can calculate the variety of measures in Table 3 which are widely used to assess the effects of noise on personnel and their performance.

For data at other intermediate near-field locations (i.e., for radial distances less than 4 meters) you can interpolate between the 36 measured data points.

TABLE 1

MEASUREMENT LOCATION AND TEST CONDITIONS- FOR OPERATOR NOISE MEASUREMENTS

D-4 Test Stand, Aircraft Hydraulic System
Wright Patterson AFB, 2 Nov 1972
FSN 4520-817-1793

Measurement Location

1

Operator Control Panel

Operation

A

System Pressurized

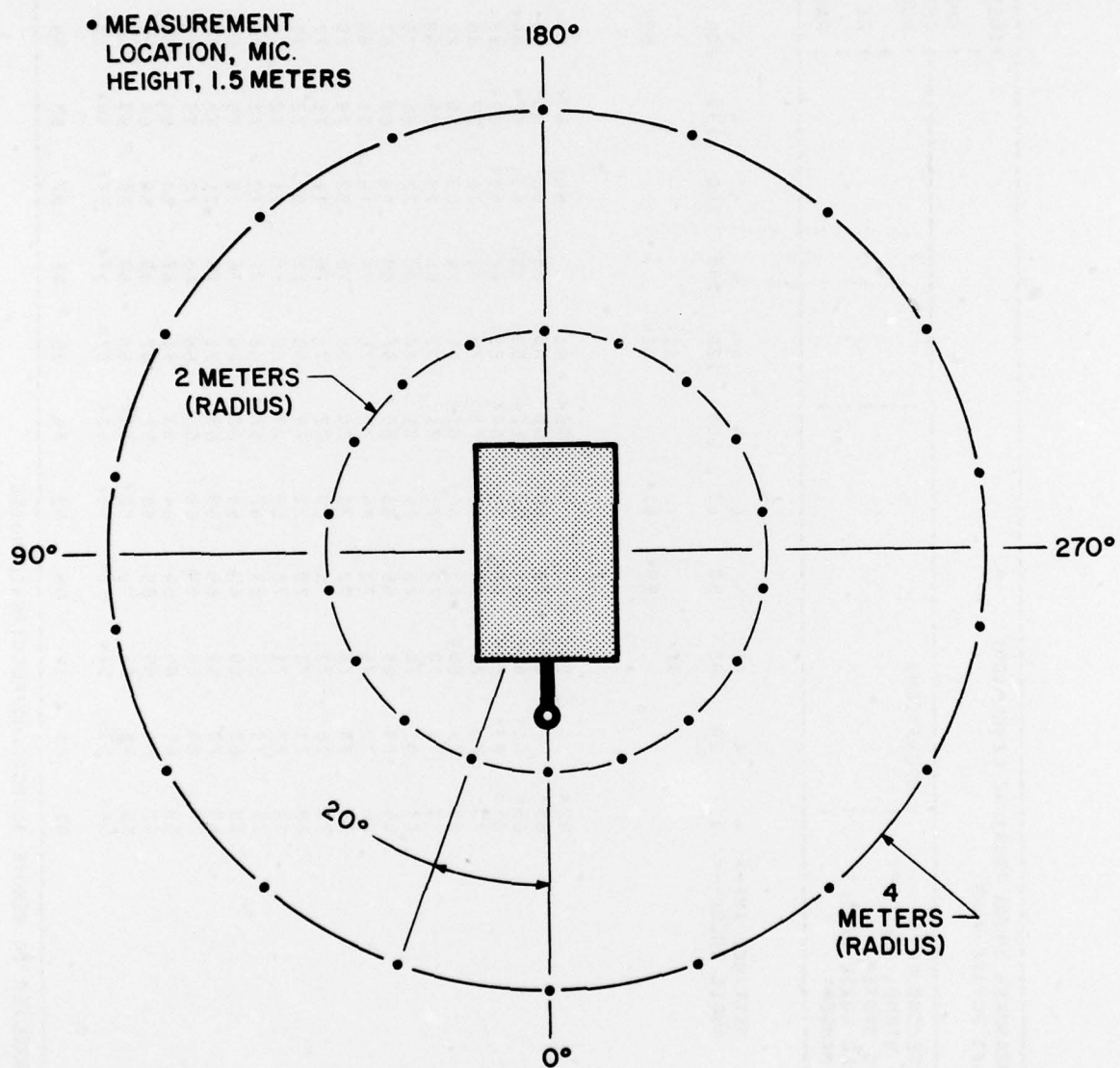


Figure 1. Measurement Locations

[illegible]

TABLE 1 MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:									
1/3 OCTAVE BAND																			
2																			
NOISE SOURCE/SUBJECT:										TEST 71-020-400									
D-4 TEST STAND, AIRCRAFT										OMEGA 3.2									
HYDRAULIC SYSTEM										RUN 02									
NEAR FIELD NOISE LEVELS										20 AUG 74									
(INSIDE HANGER)										PAGE F2									
FREQ	DISTANCE (M)-->	4	4	4	4	4	4	4	4	2	2	2	2	2	2	2	2	2	2
(HZ)	ANGLE (DEG)-->	260	260	280	300	320	340	360	380	0	0	20	40	60	80	100	120	140	160
25																			
31.5																			
40																			
50																			
63																			
80																			
100																			
125																			
160																			
200																			
250																			
315																			
400																			
500																			
630																			
800																			
1000																			
1250																			
1600																			
2000																			
2500																			
3150																			
4000																			
5000																			
6300																			
8000																			
10000																			
OVERALL																			

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

[illegible]

[illegible]

[illegible]

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:	
2 OCTAVE BAND											
NOISE SOURCE/SUBJECT: (OPERATIONS:											
O-4 TEST STAND, AIRCRAFT (										OMEGA 3.2	
HYDRAULIC SYSTEM (										TEST 71-020-400	
NEAR FIELD NOISE LEVELS (										RUN 03	
(INSIDE HANGER) (										20 AUG 74	
										PAGE J3	
DISTANCE (M)--> 2 2 2 2 2 2 2 2 2 2										OPERATOR LOCATION	
ANGLE (DEG)--> 160 180 200 220 240 260 280 300 320 340										TEST CONDITION	
FREQ (HZ)										1/A	
31.5											
63											
125	70	74	74	72	71	71	66				66
250	83	77	83	84	67	90	70	73	73		73
500	85	84	91	89	87	88	90	86	86		91
1000	83	89	87	88	87	86	86	86	80		88
2000	84	80	82	82	82	82	82	80	86		87
4000	81	81	83	84	83	82	82	80	80		85
6000	70	69	70	72	72	72	71	70	78		83
									68		72
OVERALL	90	91	94	93	93	94	93	93	90		95

TABLE: MEASURES OF HUMAN NOISE EXPOSURE														IDENTIFICATION:	
3															
NOISE SOURCE/SUBJECT: (OPERATION:)														OMEGA 3.2	
D-4 TEST STAND, AIRCRAFT ()														TEST 71-020-400	
HYDRAULIC SYSTEM ()														RUN 01	
NEAR FIELD NOISE LEVELS ()														20 AUG 74	
(INSIDE HANGER) ()														PAGE H1	
DISTANCE (M)--> 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4															
ANGLE (DEG)--> 0 20 40 60 80 100 120 140 160 180 200 220 240															
HAZARD/PROTECTION															
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR															
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR															
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)															
NO PROTECTION															
MINIMUM QPL EAR MUFFS															
OASLC															
OASLA															
T															
AMERICAN OPTICAL 1700 EAR MUFFS															
OASLA*															
T															
V-51R EAR PLUGS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS															
OASLA*															
T															
H-133 GROUND COMMUNICATION UNIT															
OASLA*															
T															
COMMUNICATION															
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)															
PSIL															
ANNOYANCE															
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNOB)															
TONE CORRECTION (C IN DB)															
PNLT															
C															
* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.															

TABLE: MEASURES OF HUMAN NOISE EXPOSURE													
IDENTIFICATION:													
3													
NOISE SOURCE/SUBJECT:	(	OPERATION:											OMEGA 3.2
D-4 TEST STAND, AIRCRAFT	(												TEST 71-020-400
HYDRAULIC SYSTEM	(												RUN 03
NEAR FIELD NOISE LEVELS	(												20 AUG 74
(INSIDE HANGER)	(												PAGE H3
HAZARD/PROTECTION													
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR													
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR													
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)													
NO PROTECTION													
OASLC	90	91	93	93	93	93	94	93	93	93	93	90	95
OASLA	89	91	92	92	91	91	91	90	89	88	88	88	92
T	202	143	120	120	143	143	170	170	202	240	240	240	120
MINIMUM QPL EAR MUFFS													
OASLA*	65	64	69	69	68	69	69	69	69	69	65	65	70
T	960	960	960	960	960	960	960	960	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS													
OASLA*	60	58	63	63	62	65	65	64	64	64	60	60	66
T	960	960	960	960	960	960	960	960	960	960	960	960	960
V-51R EAR PLUGS													
OASLA*	63	66	68	67	66	66	66	66	65	63	63	67	67
T	960	960	960	960	960	960	960	960	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS													
OASLA*	49	53	53	53	52	52	52	52	50	50	50	53	53
T	960	960	960	960	960	960	960	960	960	960	960	960	960
H-133 GROUND COMMUNICATION UNIT													
OASLA*	62	64	63	64	64	64	64	63	62	61	61	65	65
T	960	960	960	960	960	960	960	960	960	960	960	960	960
COMMUNICATION													
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)													
PSIL	84	84	86	86	86	86	86	85	84	82	82	86	86
ANNOUNCE													
PERCEIVED NOISE LEVEL, TONE CORRECTED (PMLT IN PNDB)													
TONE CORRECTION (C IN DB)													
PMLT	103	104	106	106	106	106	106	105	106	104	102	107	107
C	2	2	2	2	2	2	2	3	2	2	2	2	2

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.